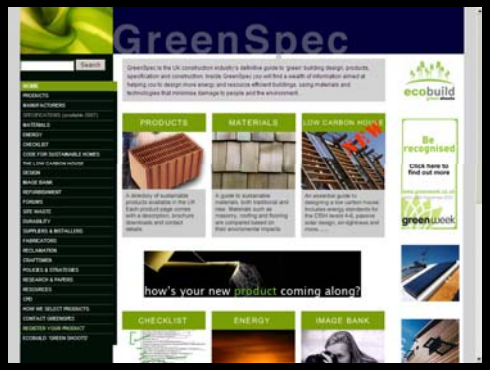
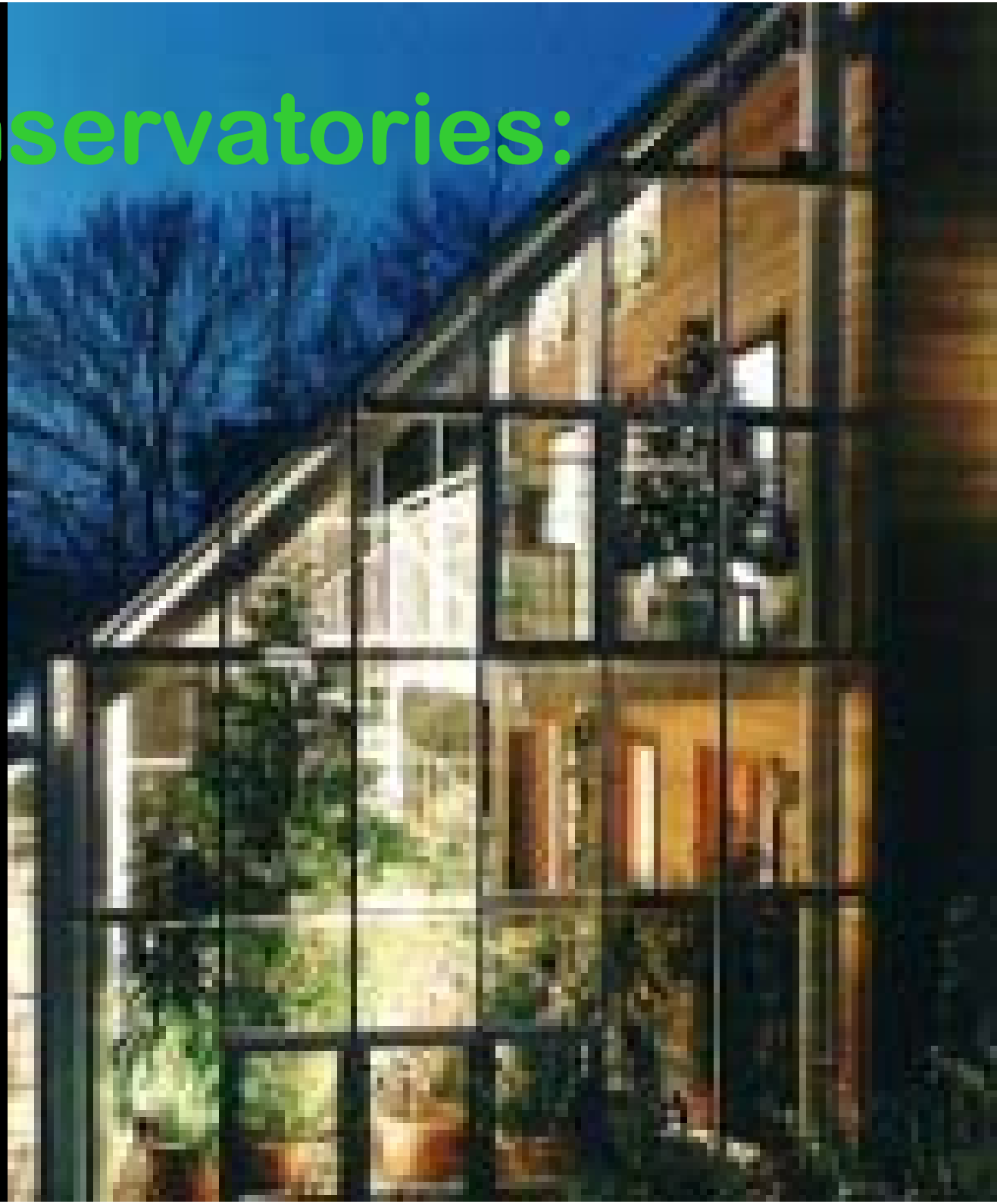


www.greenspec.co.uk

Sun Space Winter Gardens Conservatories

B12 Conservatories
Source of free heat
or a Drain on energy

Conservatories:



GreenSpec

Search

- HOME
- PRODUCTS
- MANUFACTURERS
- SPECIFICATIONS (available 2007)
- MATERIALS
- ENERGY
- CHECKLIST
- CODE FOR SUSTAINABLE HOMES
- THE LOW CARBON HOUSE
- DESIGN
- IMAGE BANK
- REFURBISHMENT
- FORUMS
- SITE WASTE
- DURABILITY
- SUPPLIERS & INSTALLERS
- FABRICATORS
- RECLAMATION
- CRAFTSMEN
- POLICIES & STRATEGIES
- RESEARCH & PAPERS
- RESOURCES
- CPD
- HOW WE SELECT PRODUCTS
- CONTACT GREENSPEC
- REGISTER YOUR PRODUCT
- ECOBUILD: 'GREEN SHOOTS'

GreenSpec is the UK construction industry's definitive guide to 'green' building design, products, specification and construction. Inside GreenSpec you will find a wealth of information aimed at helping you to design more energy and resource efficient buildings, using materials and technologies that minimise damage to people and the environment.

ecobuild green shoots

PRODUCTS

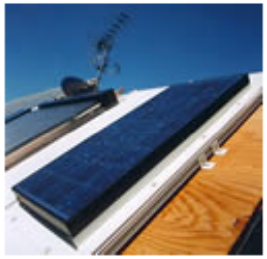
A directory of sustainable products available in the UK. Each product page comes with a description, brochure downloads and contact details.

MATERIALS

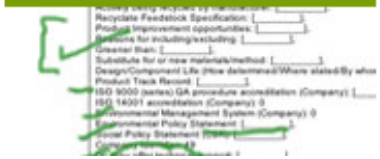
A guide to sustainable materials, both traditional and new. Materials such as masonry, roofing and flooring are compared based on their enviromental impacts.

LOW CARBON HOUSE

An essential guide to designing a low carbon house: Includes energy standards for the CfSH levels 4-6, passive solar design, air-tightness and more.....



CHECKLIST



ENERGY

IMAGE BANK

GreenSpec

Search

Research and Papers

1 Construction

'Sustainable Construction: Whole Life Cost Benefits'	A report by Cyrill Sweetts comissioned by Kent County Council / Interreg IIIA to establish the **cost of alternative materials** commonly used in sustainable construction. The survey results are tabulated to allow direct comparison and illustrate true value.
'Coping with Substitution'	**Avoiding Substitution** - The substitution of sustainable materials with non-sustainable products by contractors is a major barrier to sustainable construction. By using dedicated specifications instead of the popular generic type, the buildling designer can regain control. (*Brian Murphy, GreenSpec, 2006*)
'Commercial Green Buildings'	**Delivering Sustainable Design in the Real World** - Commercial constraints quite often stunt the ambitions of the building designer. In this paper, a strategy for breaking down these barriers is explored an the practical implications for the design of buildings in the future are discussed. (*Andrew Pettifer, Gifford & Partners, 2003*)
'UK Housing and Climate Change'	**Heavyweight vs lightweight construction** - This important report demonstrates that as UK temperatures climb,' lightweight' buildings are ill-prepared to meet the challenge. 'Heavyweight' construction that borrows from traditional cooling techniques in Southern Europe is setting the model for future housing developments. (*Ove Arup and Bill Dunster Architects, 2005*)
'Thermal Mass for Housing'	**Concrete solutions for the changing climate** - This guide provides information on the simple, passive design techniques that can be applied in masonry and concrete dwellings to take advantage of their inherent thermal mass on a year-round basis. (*The Concrete Centre, 2006*)
'Earth Brick Construction'	This report presents the results of a two-year research programme to monitor and evaluate the performance of **earth masonry in modern wall construction**. The programme made a detailed study of one new building through the complete construction process, including design, procurement and occupation. It also took into consideration several other projects that used these materials. Tom Morton is currently writing '*Earth Masonry: Design & Construction Guidelines*' to be published by the BRE in Spring 2007.
'Intro to the Green Guide'	**An Introduction to the Green Guide to Specification** - This introduction looks at the fundamentals of the Green Guide and how it works for building designers (*Tuija Halonen, BRE, 2005*)
'GreenSpec and the Market'	Far from leading the way, the **GreenGuide preserves the status quo** and stifles the market in green

GreenSpec

COMMERCIAL GREEN BUILDINGS

by Andrew Pettifer

DELIVERING SUSTAINABLE DESIGN IN THE REAL WORLD

INTRODUCTION

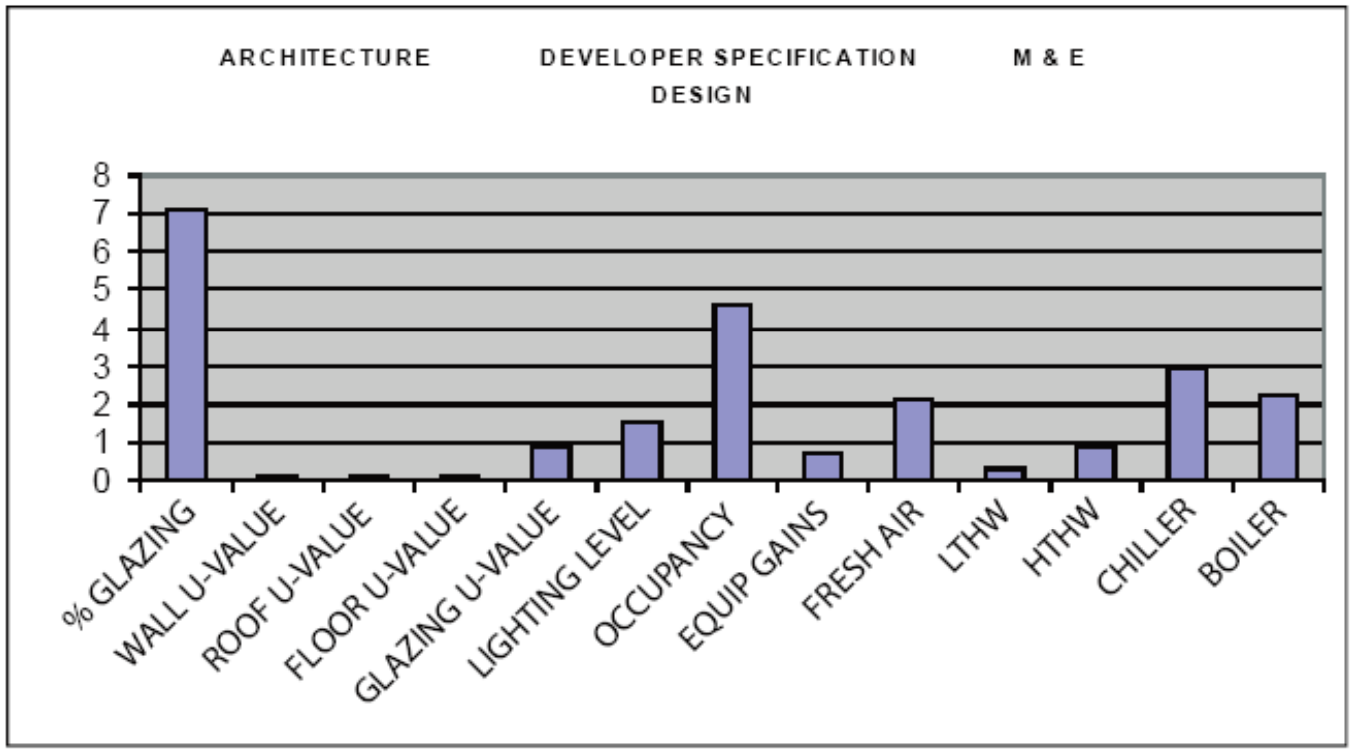
In a small number of high profile construction projects the principles of sustainable design shape the entire brief and become the defining feature of the project. For the great majority of clients, however, commercial constraints limit or more often totally negate any environmental aspirations of the client or design team. In the private sector this is because of the need to make money and in the public sector because of the lack of it.

The environmental imperative of taking a sustainable approach to construction projects is recognised widely and the arguments are well rehearsed and oft repeated; fifty per cent of energy use in the UK is from buildings; the average Brit consumes Mother Earth's resources at three times the rate she can replenish them; global warming is proven and shaping our climate. Too often papers and lectures are delivered that address these concerns at a strategic level but offer little help to the practitioner. We need to stop harping on about the problems and start delivering some solutions.

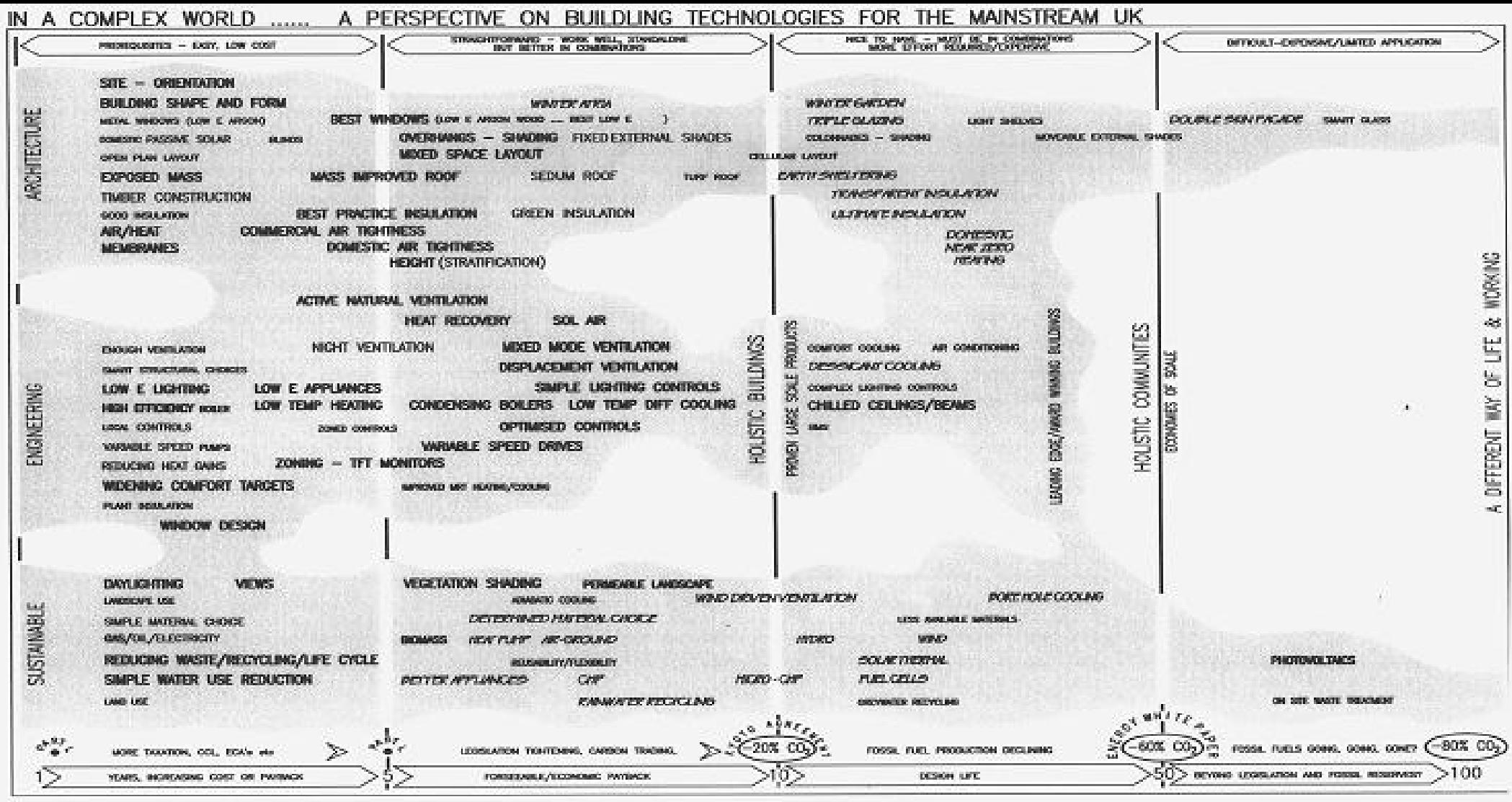
This paper looks at barriers to the delivery of sustainable buildings in the 'real' (ie commercial) world. A strategy for breaking down these barriers known as 'Commercial Green' is explored and the practical implications for the design of buildings in the future are discussed.

Commercial Green buildings let the building fabric do the work of controlling the internal environment, allowing the building services to be simple, low intensity and low cost. We might even be able to save enough money on the services to pay for the improvements required to the building fabric and create a significant incremental improvement without a capital cost investment.

The table below highlights the relative importance of various factors in terms of energy consumption for an air conditioned office building and gives us a clue as to where we should be concentrating our efforts.



IN A COMPLEX WORLD ..... A PERSPECTIVE ON BUILDLING TECHNOLOGIES FOR THE MAINSTREAM UK



IN A COMPLEX WORLD ..... A PERSPECTIVE ON BUILDING TECHNOLOGIES FOR THE MAINSTR

PREREQUISITES – EASY, LOW COST

STRAIGHTFORWARD – WORK WELL STANDALONE BUT BETTER IN COMBINATIONS

NICE TO HAVE – MUST BE IN COMBINATIO MORE EFFORT REQUIRED/COMPLEX

ARCHITECTURE

SITE – ORIENTATION

BUILDING SHAPE AND FORM

METAL WINDOWS (LOW E ARGON)

BEST WINDOWS (LOW E ARGON WOOD __ BEST LOW E)

WINTER ATRIA

WINTER GARDEN

DOMESTIC PASSIVE SOLAR

BUSES

OVERHANGS – SHADING

FIXED EXTERNAL SHADES

TRIPLE GLAZING

LIGHT SHELVES

COLONNADES – SHADING

OPEN PLAN LAYOUT

MIXED SPACE LAYOUT

CELLULAR LAYOUT

EXPOSED MASS

MASS IMPROVED ROOF

SEDUM ROOF

TURF ROOF

EARTH SHELTERING

TIMBER CONSTRUCTION

TRANSPARENT INSULATION

GOOD INSULATION

BEST PRACTICE INSULATION

GREEN INSULATION

ULTIMATE INSULATION

AIR/HEAT MEMBRANES

COMMERCIAL AIR TIGHTNESS

DOMESTIC AIR TIGHTNESS

HEIGHT (STRATIFICATION)

DOMESTIC NEAR ZERO HEATING

ENGINEERING

ACTIVE NATURAL VENTILATION

HEAT RECOVERY

SOIL AIR

ENOUGH VENTILATION

NIGHT VENTILATION

MIXED MODE VENTILATION

SMART STRUCTURAL CHOICES

DISPLACEMENT VENTILATION

LOW E LIGHTING

LOW E APPLIANCES

SIMPLE LIGHTING CONTROLS

HIGH EFFICIENCY BOILER

LOW TEMP HEATING

CONDENSING BOILERS

LOW TEMP DIFF COOLING

LOCAL CONTROLS

ZONED CONTROLS

OPTIMISED CONTROLS

VARIABLE SPEED PUMPS

VARIABLE SPEED DRIVES

REDUCING HEAT GAINS

ZONING – TFT MONITORS

WIDENING COMFORT TARGETS

IMPROVED MIX HEATING/COOLING

PLANT INSULATION

WINDOW DESIGN

HOLISTIC BUILDINGS

PROVEN LARGE SCALE PRODUCTS

COMFORT COOLING

AIR CONDITIONING

DESICCANT COOLING

COMPLEX LIGHTING CONTROLS

CHILLED CEILINGS/BEAMS

MVHR

LEADING EDGE/HIGH RISK/HIGH BUILDINGS

SUSTAINABLE

DAYLIGHTING

VIEWS

VEGETATION SHADING

PERMEABLE LANDSCAPE

LANDSCAPE USE

ADIABATIC COOLING

WIND DRIVEN VENTILATION

BOREHOLE C

SIMPLE MATERIAL CHOICE

DETERMINED MATERIAL CHOICE

LESS AVAILABLE MATERIALS

GAS/OIL/ELECTRICITY

BIOMASS

HEAT PUMP AIR-GROUND

HYDRO

WIND

REDUCING WASTE/RECYCLING/LIFE CYCLE

RELIABILITY/FLEXIBILITY

SOLAR THERMAL

SIMPLE WATER USE REDUCTION

BETTER APPLIANCES

CHP

MICRO-CHP

FUEL CELLS

LAND USE

RAINWATER RECYCLING

GREYWATER RECYCLING

MORE TAXATION, CCL, ECA's etc

LEGISLATION TIGHTENING, CARBON TRADING

20% CO_2

FOSSIL FUEL PRODUCTION DECLINING

1

YEARS, INCREASING COST OR PAYBACK

5

FORESEEABLE/ECONOMIC PAYBACK

10

DESIGN LIFE

Sustainable Engineering Architecture

Holistic Buildings Proven Large Scale Technology Holistic Communities

Prerequisites, easy, low costs

Straightforward, work well, standalone, better communal

Nice to have, more effort required, expensive

Site – Orientation
Building shape and form
Metal windows Low E Argon
Domestic Passive Solar
Open Plan Layout
Exposed Mass
Timber Construction
0.00 Insulation
Air/Heat
Membranes

Winter Atria
Best Windows: Low E Argon Wood
Overhangs – Shading
Fixing external Shades
Mixed space Layout
Mass Improved Roof
Sedum Roof
Turf Roof
Best Practice Insulation
Green Insulation
Commercial Air tightness
Domestic Air tightness
Height (Stratification)

Winter Garden
Triple Glazing
Light Shelves
Colour _____ Shading
Move
Cellular Layout
Earth Sheltering
Transparent Insulation
Ultimate Insulation
Domestic near-zero heat

Active Natural Ventilation
Heat Recovery
Sol Air

Draught Ventilation
Night Ventilation
Mixed Mode Ventilation
Functional Checks
Displacement Ventilation
Low E Lighting
Low E Appliances
Simple Light Controls
High Efficiency Boiler
Low Temp Heating
Condensing Boilers
Low Temp Diff Cooling
Local Controls
Zoned Controls
Optimised Controls
Variable Speed Pumps
Variable Speed Drives
Reducing Heat gains
Zoning
TFT Monitors (arrived sooner)
Widening Comfort Targets
Improved ____ Heating/Cooling
Plant Insulation
Window Design

Comfort cooling
Air Conditioning
Desicant cooling
Complex lighting controls
Chilled ceiling / beams
BMS

Daylighting
Views
Landscape Use
Simple Material Choices
Gas/Oil/Electricity
Redyucing Waste/Recycling/Life Cycle
Simple Water Use Reduction
Land Use

Vegetation Shading
Permeable Landscape
_____ Cooling
Wind Driven Ventilation
Determined Materials Choices
BioMass
Heat Pump
Air-Ground
_____
Better Applicance
CHP
Micro – CHP
Fuel Cells
Rainwater Harvesting

Poke Hole
Mixed available materials
Hydro
Wind
Solar Thermal
_____ Recycling

Now

+5years
Part L & CfSH

Kyoto Targets
-20% CO2

+10
CfSH

+50
Energy White Paper
-60% CO2

Green Houses & Conservatories: Summer

- Glass permit the passage of the rays from the sun to warm the interior
- This can be released in summer by ventilation
- Victorians understood the need for opening vents in the roofs to release the heat in the summer, high enough to exploit the stack effect, catch any breeze and ensure heads do not cook.
- Most PVC conservatories only have windows in the sides, a real problem

Zero Energy Development

Reduce demand for artificial light and heating:
Outdoor living
Conservatory life
sunny warm cave
to retreat to in
the cold of night

HHP Hockerton Housing Project, Newark, Nottinghamshire

Hot house
in the middle
of winter
Ventilation
for summer
No heating
Solar gain
Exposed
thermal mass
Windows and
Doors to house

Hockerton & BedZED

- Conservatories are double glazed and Low Emissivity coated to allow the heat in, prevent it escaping and trap the heat for use
- Doors and windows from conservatory to house are triple glazed Low E for the same reason
- The doors and windows are closed not letting any heat from building out into conservatory
- Until the conservatory is hot enough then windows and doors are opened to let a burst of heat into the building to heat up the fabric

Green Houses & Conservatories: Winter

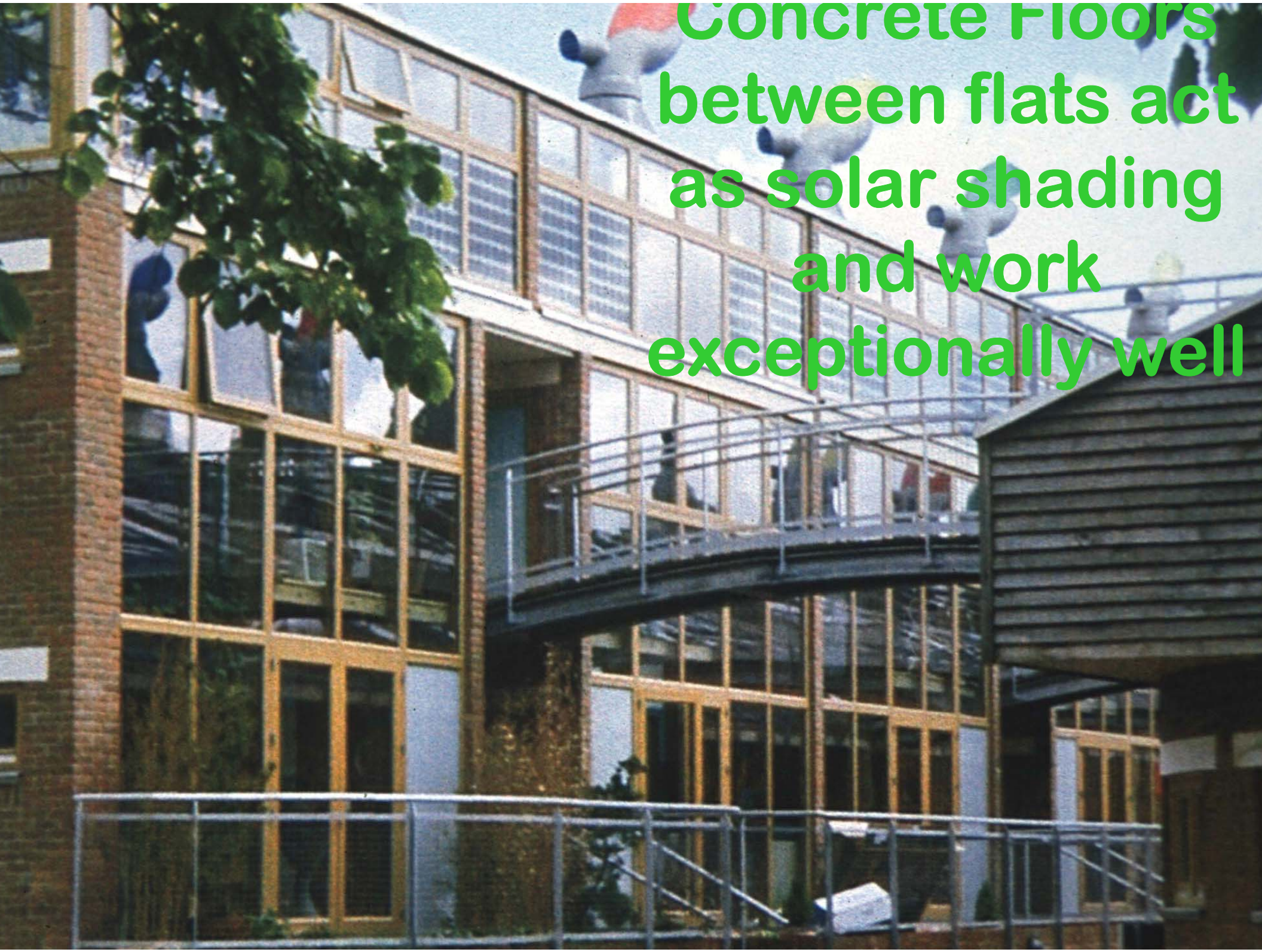
- Glass permit the passage of the rays from the sun to warm the interior
- Close all opening vents, doors and windows capture the heat
- This can be exploited in winter
- Grow plants that would otherwise perish

Green Houses and Conservatories: Winter

- Thermal mass is where the construction materials are usually dense, close to the surface have large surface area, can absorb and store heat
- Conservatories can capture heat in sunny but cold weather
- Intelligent use of thermal mass in floors and rear walls can exploit the captured heat by storing it and saving it until the sun has disappeared and release it to warm the occupants of the conservatory.

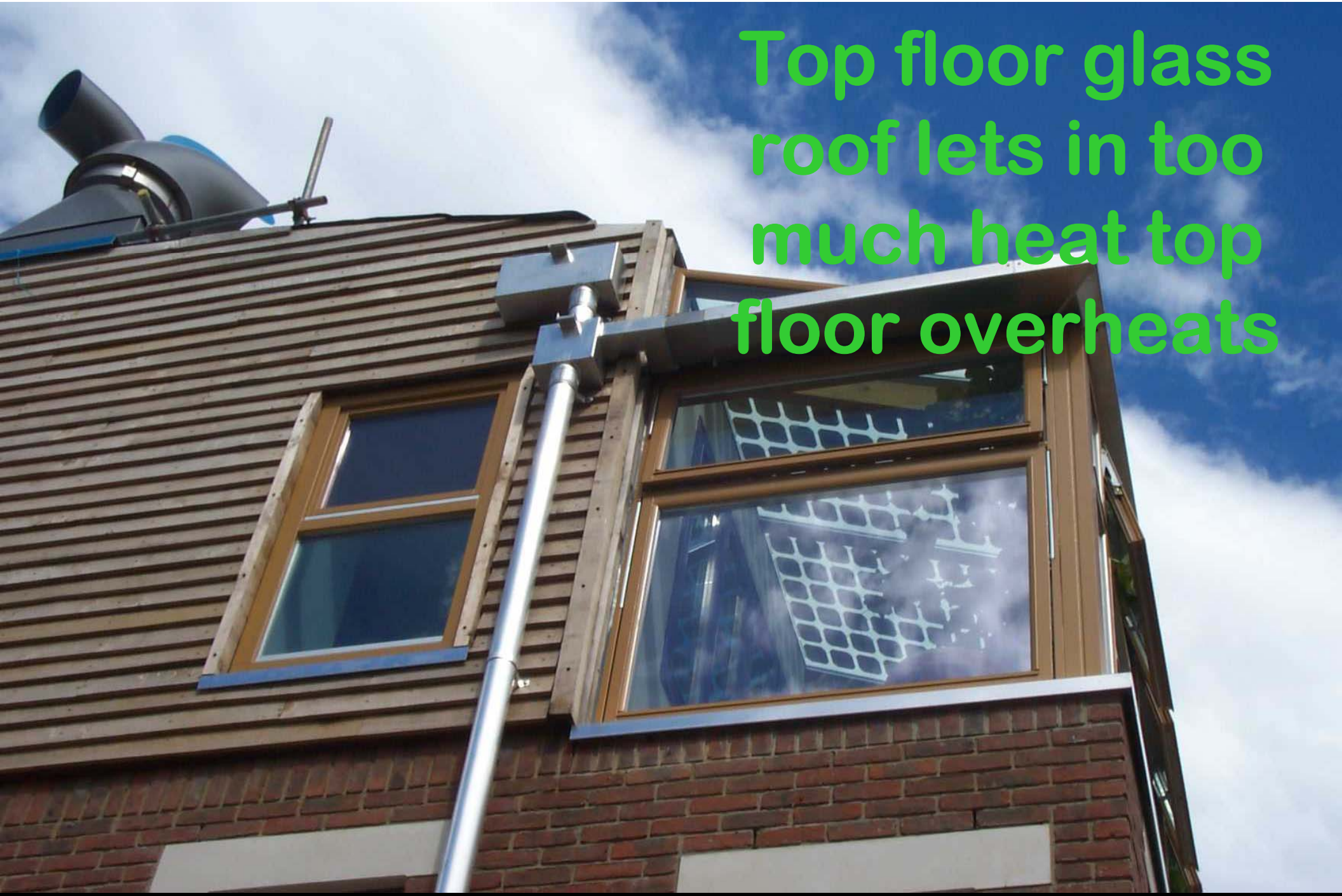
Lean-to Conservatories: warm the house

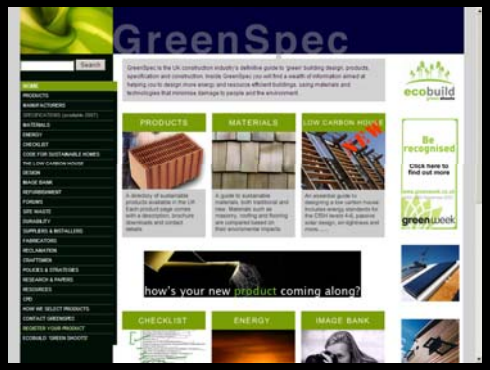
- Once a conservatory attached to a building is warmed
- it can than be used to heat the interior of the attached building by opening doors and windows between them to let the heat into the building
- The building's thermal mass can be warned and heat stored for release into the building later after the sun has gone


Concrete Floors
between flats act
as solar shading
and work
exceptionally well

Sunroom on
South face
captures the sun

Heavy
building
elements
store the heat
and release it
later





National Green Specification

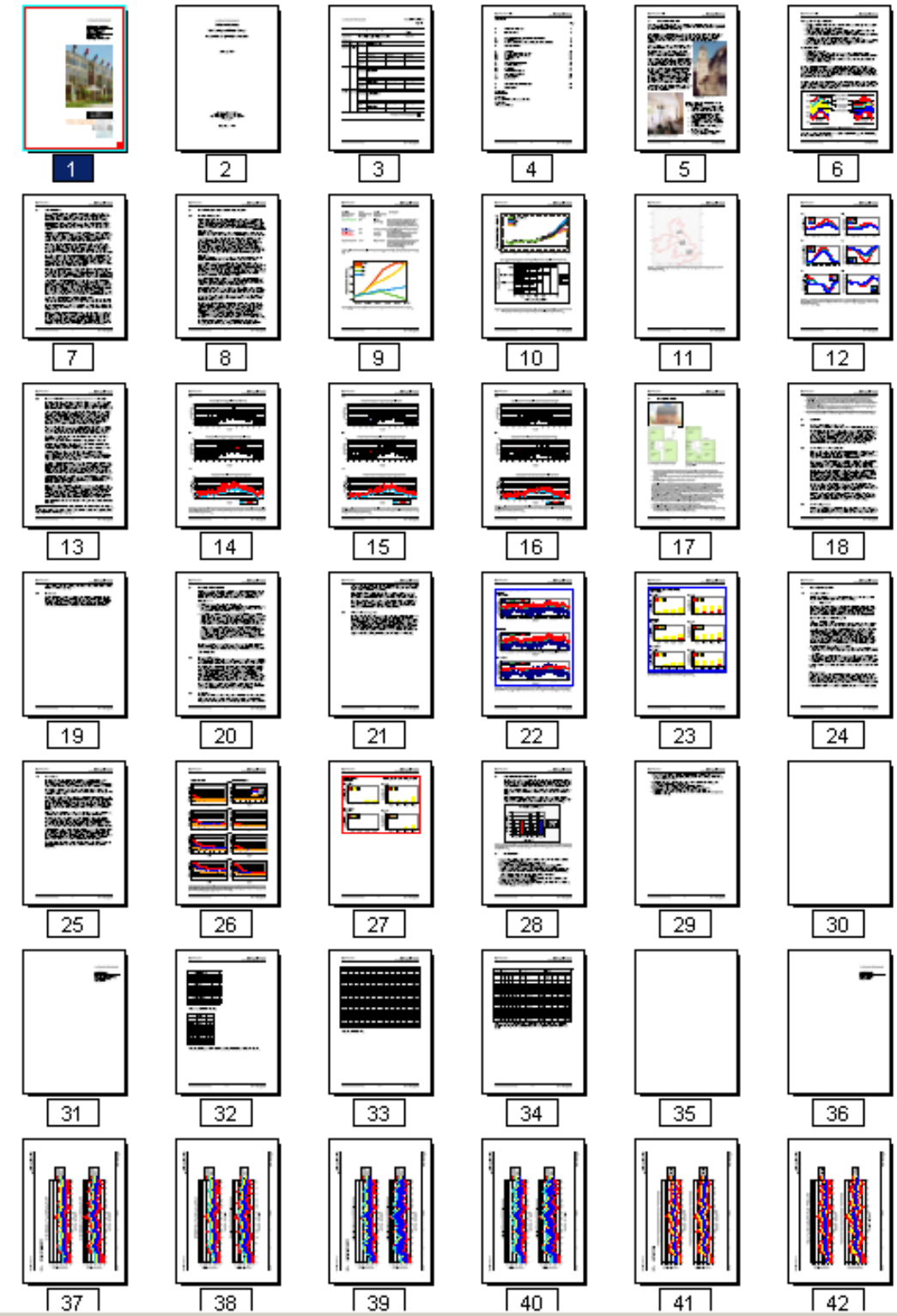
www.greenspec.co.uk

Thermal Mass

Ventilation, warmth and coolth

Heat movement in buildings

- ARUP/B Dunster Report on need for Thermal mass in buildings to cope with climate change global warming
- Recommend internal doors are self closing to hold heat energy where it is created or collected
- All partitions to be insulated
- Then actively move heat wherever you may want it or leave it where it is



Arup**Research+Development**

Bill Dunster Architects

UK Housing and Climate Change

Heavyweight vs. lightweight construction

bdazedfactory

Feilden Clegg Bradley Architects LLP

RIBA

ARUP

8.26 x 11.69 in

http://www.greenspec.co.uk/documents/whitepapers/MB_Thermal%20Mass%20for%20Housing.pdf#search='passive%20ventilation'

Options


i

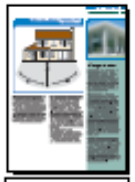

Sec1:ii


Sec1:1


SecC:22


SecC:23


SecC:24


SecC:25


SecC:26


SecC:27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SecC:29


SecC:210


SecC:211


SecC:212


SecC:213


SecC:214


SecC:215


SecC:216


SecC:217


SecC:218


SecC:219


SecC:220


SecC:221


SecC:222

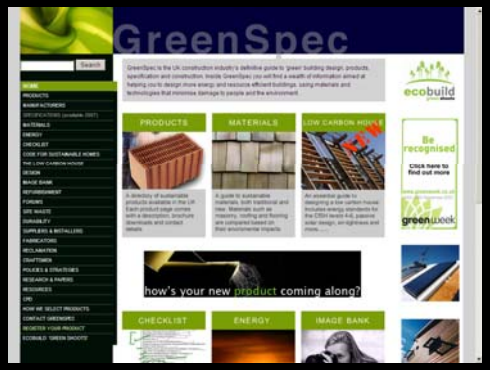
The Concrete Centre™

Thermal Mass for Housing

CONCRETE SOLUTIONS FOR THE CHANGING CLIMATE

Exploiting thermal mass

- If the building has high thermal mass and its surfaces are exposed
- they can be exploited in both heating and cooling
- In winter the mass can be heated in the day the heat stored for exploitation in the night
- In summer the mass can be cooled in the night and exploited in the day

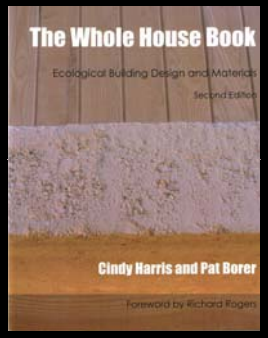


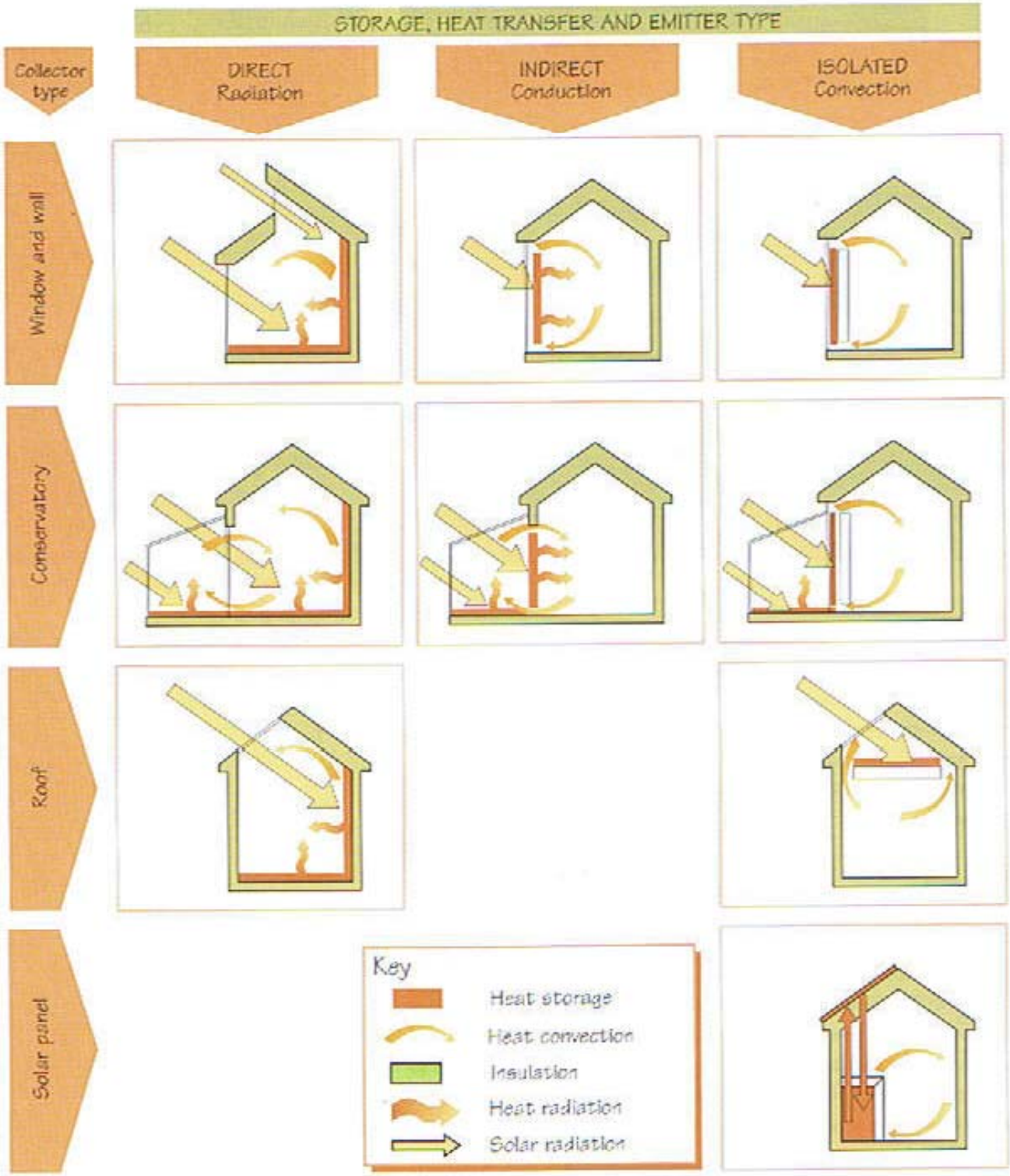
Thermal mass

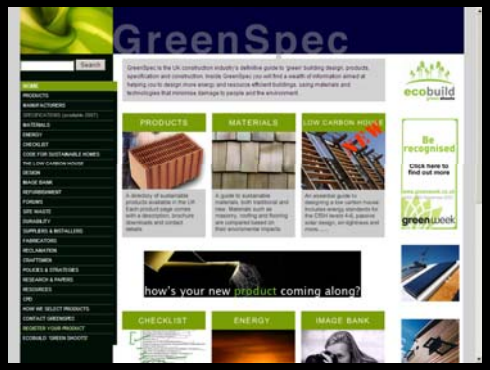
National Green Specification

www.greenspec.co.uk

- Large surface areas are best
- Thickness closest to surface is used in daily cycles,
- Full thicknesses and more used over annual cycles
- Higher density material is best
- Exposed to the space not hidden above ceilings or below floors
- Exposed to the sun's rays is good
- Embedded pipes can be exploited to move warmth and coolth around building or into storage


The Whole House Book
Ecological Building Design and Materials
Second Edition
Cindy Harris and Pat Borer
Foreword by Richard Rogers


STORAGE, HEAT TRANSFER AND EMITTER TYPE
Collector type
DIRECT Radiation
INDIRECT Conduction
ISOLATED Convection
Window and wall
Conservatory
Roof
Solar panel
Key
Heat storage
Heat convection
Insulation
Heat radiation
Solar radiation



www.greenspec.co.uk

Hockerton HHP

Conservatories

Zero Energy Development

Hockerton Newark Nottinghamshire

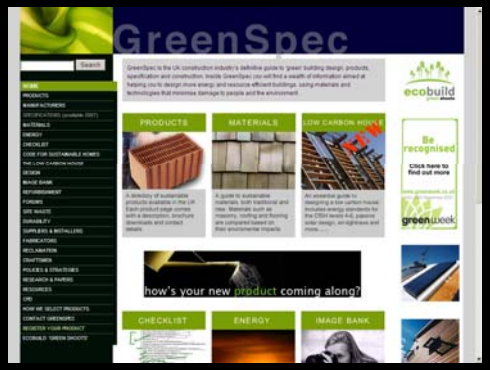
Reduce demand for artificial light and heating:

Outdoor living

Conservatory life

Sunny warm cave to retreat into From the cold of night

Hot house in the middle of winter



www.greenspec.co.uk

BedZED

Conservatories

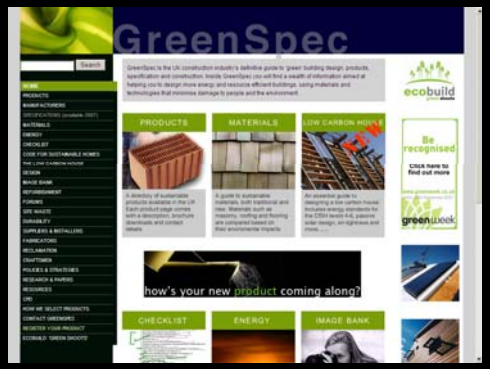
Zero (Fossil Fuel) Energy Development

BedZED Beddington Sutton Architect: Dr Bill Dunster

Profile:
to ensure sun penetration over roofs reaches sill of office space windows
Sun rooms on south side
Thermally massive floors walls and roofs store heat until required

Sunroom on
South face
captures the sun

Heavy
building
elements
store the heat
and release it
later



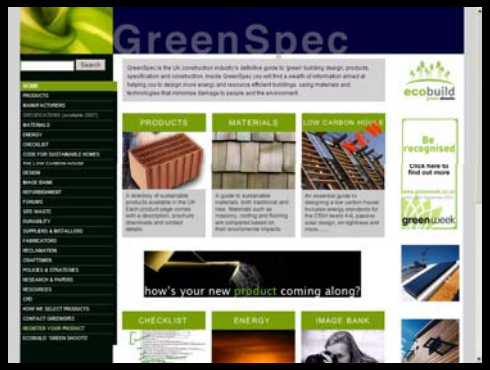
National Green Specification

www.greenspec.co.uk

Gallions HA

Conservatories

Gallions Housing Association: Tenants would not choose the conservatory but now they have it would not give it up



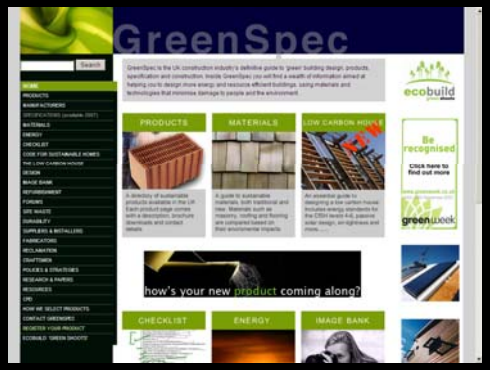
www.greenspec.co.uk

Conservatories Gone Wrong

In the real world

Conservatories gone wrong

- Heated Conservatories (why not Solar?)
- Radiant Heated Conservatories (under floor heating)
- If there is nothing to hit, the heat goes up and out the glass roof
- Electrically Heated Conservatories (+++CO_2)
- Conservatories open to remainder of building (Heat gain or heat loss)
- Conservatories without ventilation (over-heating)

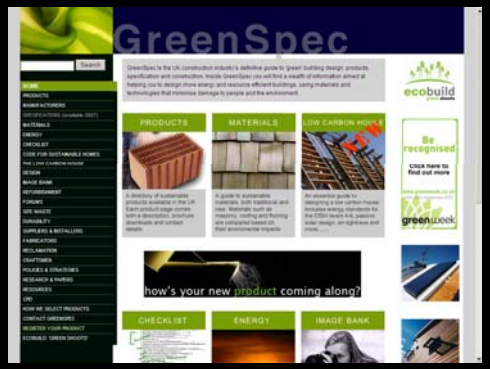


www.greenspec.co.uk

National Botanic Gardens of Wales

Glass roof

Glass Roof: gain & loose heat
no solar gain or heat loss control



National Green Specification

www.greenspec.co.uk

GLA Head Quarters

North Facing Conservatory

North facing conservatory

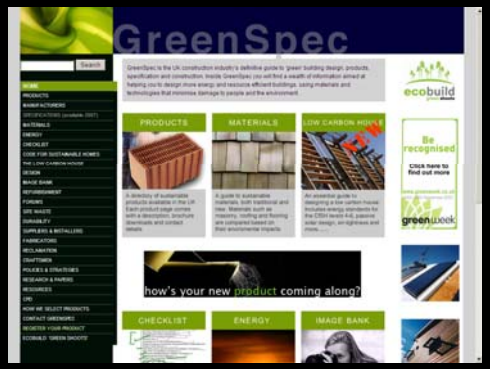
No hope then

- 90% of UK conservatories have heating installed
- In terms of fuel use they are like a gushing tap over a gulley
- Significant number have no doors or windows to separate from the rest of the house
- Despite the Building Regulations

Conservatory Gone Wrong

- No boundary between conservatory and accommodation beyond
- No thermal mass wall or floor to hold the heat
- No entry or exit ventilation in glazed roof
- No Solar shading (externally is best)
- Tenant fitted Air Conditioning

Conservatory design gone wrong: solar gain, shading but no ventilation Tenant fitted Air-conditioning



National Green Specification

www.greenspec.co.uk

1NTEGER @ BRE

Intelligent & green

Not very intelligent Conservatory:
Secure all-weather garden
single glazed and double to house but open at top floor
Some solar shading, some planting

1NTEGER house conservatory at BRE is not all that it could be

Single glazed

No thermal mass back wall,

open to living accommodation on top floor.

Just sheltered out door space

Opening vents in side walls of conservatory but only half way up the height of the conservatory

Thermostat control piston actuated vents
Thermostat at high level? Vents at mid level

Doors:
provide low level ventilation
Windows:
none at top
Internal solar shading:
internal radiant heating & thermal stress

Solar Thermal ET for Hot Water
Roof window & minimal PV

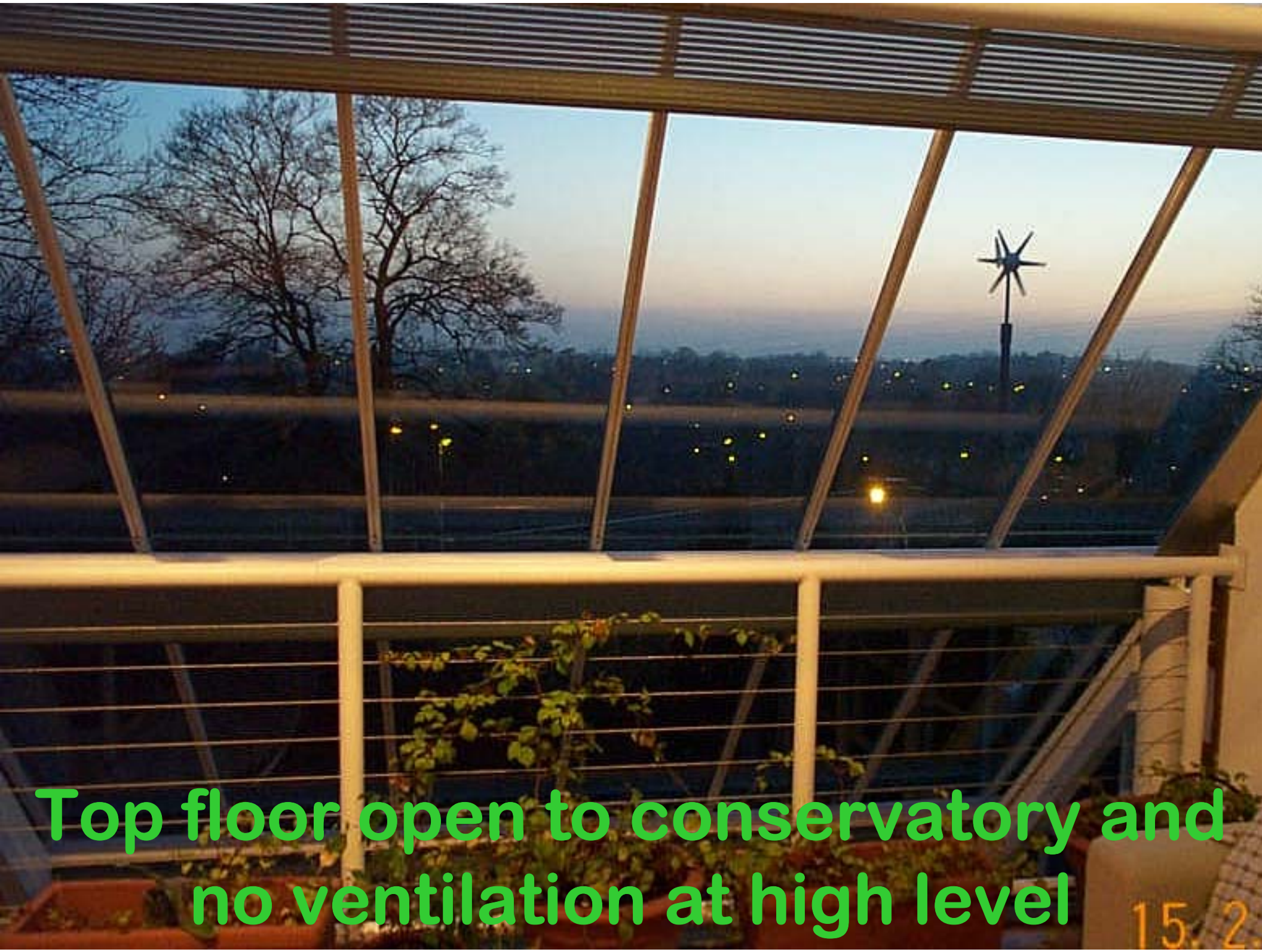
Rainwater: collection and disposal? Any Harvesting and reusing?


15. 2. 2001

Internal Solar shading
No Thermal Mass on rear wall
Some thermal mass on floor

Top floor open to hottest part of conservatory

Internal solar shading: catches solar radiation heats up and re-radiates heat inwards. Energy efficient light fittings?


Top floor open to conservatory and
no ventilation at high level

Bedrooms face South & open onto the warm conservatory, no escape

Test Yourself

- What are the ideal characteristics of a conservatory?
- How does HHP Hockerton exploit Thermal mass?

How did you do

- North facing, large glass areas, low E glass to trap heat, window and door vents at high and low level, external controllable solar shading
- High density, large surface area, exposed to passive heat gains from sun
- Traps sun in conservatory, heats up floor and back wall then warms up house interior